

REMARKS

Claims 11-17 and 19-25 are currently pending in this application with claims 11 and 20 being in independent form. Claims 11 and 20 are currently amended. Particularly, claim 11 has been amended to indicate that the hydrogen scavenger is potassium permanganate. Support for the claim amendments can be found, for example in the specification as filed. In view of the claim amendments and following remarks, withdrawal of the rejections and reconsideration of claims 11-17 and 19-25 are respectfully requested.

Claim Objections

Claims 20 and 25 are objected to as being in improper dependent form for failing to further limit the subject matter of a previous claim. In view of the claim amendments to claims 20 and 25, withdrawal of the objections is respectfully requested.

35 U.S.C. §103(a) Usui

Claims 11-25 have been rejected under 35 U.S.C. §103(a) as being obvious over United States Patent Application Publication No. 2004/0042965 to Usui et al. (hereinafter "Usui"). Applicants respectfully traverse for at least the following reasons.

The Usui reference is applied for teaching a composition comprising aluminum, magnesium and iron powder, fillers, additives and/or hydrogen scavengers. [Office Action, page 3.]

Amended claim 11 is directed toward an electrochemically reacting composition comprising active materials of aluminum, magnesium and iron, a filler material, a hydrogen scavenger, an additive and an electrolyte. The magnesium comprises 10-90% by weight of said active materials, the aluminum comprises 10-90% by weight of said active materials, the iron comprises 0-15% by weight of said active materials, the filler material comprises 5-50% by weight of said active materials, the hydrogen scavenger is potassium permanganate comprises 5-30% by weight of said active materials, and the additive comprises 0-20% by weight of said active materials.

Because Usui does not teach or suggest potassium permanganate as a hydrogen scavenger having 5-30% active materials, Usui does not render the claimed invention obvious.

As previously indicated, the claimed electrochemically reacting composition requires the hydrogen scavenger potassium permanganate in the percentage of between 5 to 30% active material. As seen in Fig. 1 of the present application, the use of the claimed range of potassium permanganate results in an exothermic reaction, wherein the temperature of the reaction system (once achieved) is maintained for a longer duration of time.

Particularly, potassium permanganate plays an extremely important in the claimed electrochemically reacting composition. [Fig. 2 and specification at [0042]]. At one level, potassium permanganate reacts with the nascent hydrogen evolved during the electrochemical reaction to produce more heat thus adding to the heat generated during the reaction and thereby sustaining the heat generation process over a longer duration of time. [Fig. 2 and specification at [0042]]. At another level, potassium permanganate produces water when it reacts with hydrogen thereby reducing the requirement of water to start the electrochemical reaction itself. [Fig. 2 and Specification at [0042]]. Additionally, the potassium permanganate acts as a scavenger of hydrogen as it removes undesirable hydrogen, produced during the electrochemical reaction, by reacting with it and producing more heat and water. [Fig. 2 and specification at [0042]]. Sodium silicate acts as a gelling agent and when used together with potassium permanganate, it helps in sustaining the generation of heat over a longer duration. [Fig. 2 and specification at [0042]].

Because Usui does not teach or suggest potassium permanganate as a hydrogen scavenger having 5-30% active materials, Usui does not render the claimed invention obvious.

Additionally, independent amended claim 20 is directed to a composition prepared by a process comprising

- (i) preparing active materials by placing commercially available 10-90% magnesium by weight of the entire active materials, having particle size varying from 1-500 μm , 10-90% aluminum by weight of the entire active materials, having particle size varying from 2-100 μm , and 0-15% iron weight wise of the entire active materials and having particle size varying from 20-200 in the container of a conventional ball mill;
- (ii) adding to said active materials a filler material 5-50% weight wise over the weight of the said active materials;

- (iii) ball milling the mix of said active materials and the said filler material for about 4-6 hours and transferring the entire mix to another container after completion of the ball milling operation;
- (iv) adding a hydrogen scavenger 5-30% weight wise over the entire weight of the active materials and mixing thoroughly to obtain a homogenous mix;
- (v) adding an additive 2-20% weight wise over the entire active materials to the homogenous mix obtained from step (iv);
- (vi) adding any salt of strong acid and strongly or weak base 2-10% weight wise over the weight of the entire active materials to the mix obtained from step (v);
- (vii) compacting of the entire mix obtained from step (v) through a conventional pressing machine and giving it a desirable shape such as strip or pellet; and
- (viii) storing the compacted and cut electrochemical heat source in air tight containers such as pouch to avoid ingress of water.

Applicants assert that the process used to produce the claimed electrochemically reacting composition would be expected to impart distinctive structural characteristics to the final product, i.e, a composition able to release of heat for a longer duration of time. Particularly, the claimed method of mixing the components, milling the composition in an inert atmosphere, adding filler and potassium permanganate and reacting the entire composition with a solution of sodium silicate provides a composition able to release heat for a longer duration of time.

Additionally, Applicants note that the Usui reference discloses a composition having dispersion stability that withstands continuous molding and excellent drainage property. The molds described in the Usui reference are the essential feature of its invention. No such mold is required in the present application.

In view of the claim amendments and aforementioned remarks, claims 11 and 20 are believed to be nonobvious in view of the teachings of Usui. Claims 12-17, 19 and 21-25 depend from and further limit claims 11 or 20 and are believed to be nonobvious for at least the aforementioned reasons. Withdrawal of the rejection under 35 U.S.C. §103(a) and reconsideration of claims 11-17 and 19-25 are respectfully requested.

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CONCLUSION

In view of the claim amendments and remarks, reconsideration and allowance of claims 11-17 and 19-25 are respectfully requested.

Should the Examiner have any questions or concerns, the Examiner is invited to contact Applicants' undersigned attorney by telephone at 412-471-8815.

Respectfully submitted,

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